What is claimed is:

1. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being catalyzed by an addition of Cu(II) in the presence of a reducing agent for reducing said Cu(II) to Cu(I), *in situ*, in catalytic amount.

2. A process according to claim 1 wherein the reducing agent is selected from the group consisting of ascorbate, quinone, hydroquinone, vitamin K_1, metallic copper, glutathione, cysteine, Fe^{2+}, Co^{2+}, and an applied electric potential.

3. A process according to claim 1 wherein the reducing agent is a metal selected from the group consisting of Cu, Al, Be, Co, Cr, Fe, Mg, Mn, Ni, and Zn.

4. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being performed in a solution in contact with metallic copper, said metallic copper contributing directly or indirectly to the catalysis of the click chemistry ligation reaction.

5. A process according to claim 4 wherein the solution is an aqueous solution.

6. A process according to claim 4 wherein the first and second reactants are present during the click chemistry ligation reaction in equimolar amounts.

7. A process according to claim 4 wherein the click chemistry ligation reaction is performed in a solution in contact, at least in part, with a copper vessel.

8. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being catalyzed by an addition of a catalytic amount of a metal salt having a metal ion selected from the group consisting of Au, Ag, Hg, Cd, Zr, Ru, Fe, Co, Pt, Pd, Ni, Rh, and W.

9. A process according to claim 8 wherein the click chemistry ligation reaction being performed in the presence of a reducing agent for reducing said metal ion to a catalytically active form.

10. A process according to claim 9 wherein the reducing agent is selected from the group consisting of ascorbate, quinone, hydroquinone, vitamin K_1, glutathione, cysteine, Fe^{2+}, Co^{2+}, an applied electric potential, and a metal, the metal being selected from the group consisting of Al, Be, Co, Cr, Fe, Mg, Mn, Ni, and Zn.

11. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being performed in an aqueous solution and being catalyzed by a catalytic amount of copper (I).

12. A process according to claim 11 wherein the first and second reactants are present in equimolar amounts.

13. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation

reaction being catalyzed by a catalytic amount of copper (I), said first and second reactants being present in equimolar amounts.

14. A process according to claim 13 wherein the click chemistry ligation reaction is performed in an aqueous solution.

15. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being performed in a solution containing a catalytic amount of copper (I);
with a proviso that either the first or second reactant is toxic or expensive and the remaining reactant is present in molar excess.

16. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being performed inside a cell, said cell containing a catalytic quantity of copper(I) sufficient to catalyze the click chemistry ligation reaction, said copper(I) contributing to a catalysis of the click chemistry ligation reaction.

17. A process comprising the following step:
catalyzing a click chemistry ligation reaction between a first reactant having a terminal alkyne moiety and second reactant having an azide moiety for forming a product having a triazole moiety, the click chemistry ligation reaction being performed in a solvent containing a catalytic amount of a metal ion selected from ions from the group of metals consisting of Cu, Au, Ag, Hg, Cd, Zr, Ru, Fe, Co, Pt, Pd, Ni, Rh, and W, said metal ion contributing directly or indirectly to a catalysis of the click chemistry ligation

reaction, said metal ion being coordinated to a ligand for solubilizing said metal ion within said solvent, for inhibiting oxidation of said metal ion, and for dissociating, in whole or in part, from said metal ion during the catalysis of the click chemistry ligation reaction by said metal ion.

18. A process according to Claim 17 wherein said ligand is acetonitrile.

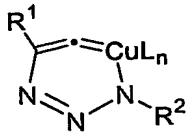
19. A process according to Claim 17 wherein said ligand is a cyanide, nitrile, or isonitrile.

20. A process according to Claim 17 wherein said ligand is water.

21. A process according to Claim 17 wherein said ligand is selected from the group consisting of nitrile, isonitrile, primary, secondary, or tertiary amine, a nitrogen bearing heterocycle, carboxylate, halide, alcohol, thiol, sulfide, phosphine, and phosphite.

22. A process according to Claim 17 wherein said ligand is polyvalent and includes one or more functional groups selected from the group consisting of nitrile, isonitrile, primary, secondary, or tertiary amine, a nitrogen bearing heterocycle, carboxylate, halide, alcohol, thiol, sulfide, phosphine, and phosphite.

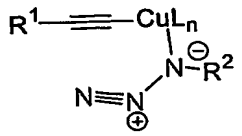
23. A reactive intermediate for producing a product having triazole moiety, the reactive intermediate being represented by the following 6-membered ring structure:



wherein:

R^1 is a 4-triazole substituent,
R^2 is a 1-triazole substituent,
L is a Cu ligand, and
"n" is 1, 2, or 3.

24. A reactive intermediate for producing a triazole, the reactive intermediate being represented by the following structure:



wherein:

R^1 is a 4-triazole substituent,

R^2 is a 1-triazole substituent,

L is a Cu ligand, and

"n" is 1, 2, 3, or 4.

25. A two step process of derivatizing an amine containing molecule with a triazole, the process comprising the following steps:

Step A: derivatizing the amine containing molecule to form a terminal alkyne, then

Step B: ligating the product of said Step A with an azide containing molecule by addition of the azide containing molecule in the presence of a catalytic amount of Cu to form a triazole derivative of the amine containing molecule.

26. A one step process for producing a polyvalent triazole, the process comprising the following step:

derivatizing a polyazide core by addition of a molecule having a terminal alkyne in the presence of a catlytic amount of Cu.

27. A one step process for producing a polyvalent triazole, the process comprising the following step:

derivatizing a polyalkyne core by addition of an azide containing molecule in the presence of a catalytic amount of Cu.